

Office of Industrial Technologies



STRATEGIC PLAN

a work in progress

August 1999



U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy



*Partnering for a Clean and Competitive
Industry of the Future*

Through the Industries of the Future strategy, the Department's Office of Energy Efficiency and Renewable Energy is partnering with U.S. industry in developing and deploying more energy efficient, cleaner and competitive technologies. Working with the nation's most energy intensive industries, together we are mapping a vision of the future of American industry and developing and deploying the

technology needed to meet that vision. This strategic plan describes a few of the many ways that the industry-DOE alliance is enabling our industrial partners to produce less expensive, better performing products in a sustainable way.

Dan W. Reicher
Assistant Secretary of Energy
Energy Efficiency and Renewable Energy

Foreword

The Office of Industrial Technologies (OIT) is located within the office of the Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy. It supports the development and use of energy efficient, competitive, and environmentally sound industrial technologies.

The vision, mission, and goals contained in this *Office of Industrial Technologies Strategic Plan* fully support the Department's Strategic Goal for Energy Resources that is contained in the Department of Energy Strategic Plan (September 1997):

The Department of Energy and its partners promote secure, competitive, and environmentally responsible energy systems that serve the needs of the public.

In particular, much of the Office's efforts are focused on achieving Energy Resources Objective 3:

Increase the efficiency and productivity of energy use, while limiting environmental impacts.

Table of Contents

Mission	1
Vision	1
Goals	1
Situation Analysis	2
Core Values	4
Key Operating Principles	4
Strategy	5
Performance Measures	10
Implementation	11

Mission

The Office of Industrial Technologies, through partnerships with industry, government, and non-government organizations, develops and delivers advanced technologies and practices to assist industry in meeting challenging goals in the areas of energy efficiency, and global competitiveness.

Vision

The Office of Industrial Technologies aspires to accomplish its mission by being:

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- **Responsive** to the needs of its industrial customers by adapting, improving and implementing the Industries of the Future strategy;
 - **An expert** facilitator of partnerships;
 - **A leader** in leveraging technology investments within government and with industry and other partners;
 - **A recognized source** of the most knowledgeable federal government experts on industrial process systems and technology and a recognized source for a network of services and resources that support OIT's mission;
 - **A key contributor** in assisting other U.S. government agencies adapt OIT's Industries of the Future model to their own situation and needs.

Goals

By partnering with the industry, OIT will motivate and will assist industry develop technology solutions to critical energy and environmental challenges that will produce important national benefits per unit of Gross National Product. Major goals of the Office of Industrial Technologies are:

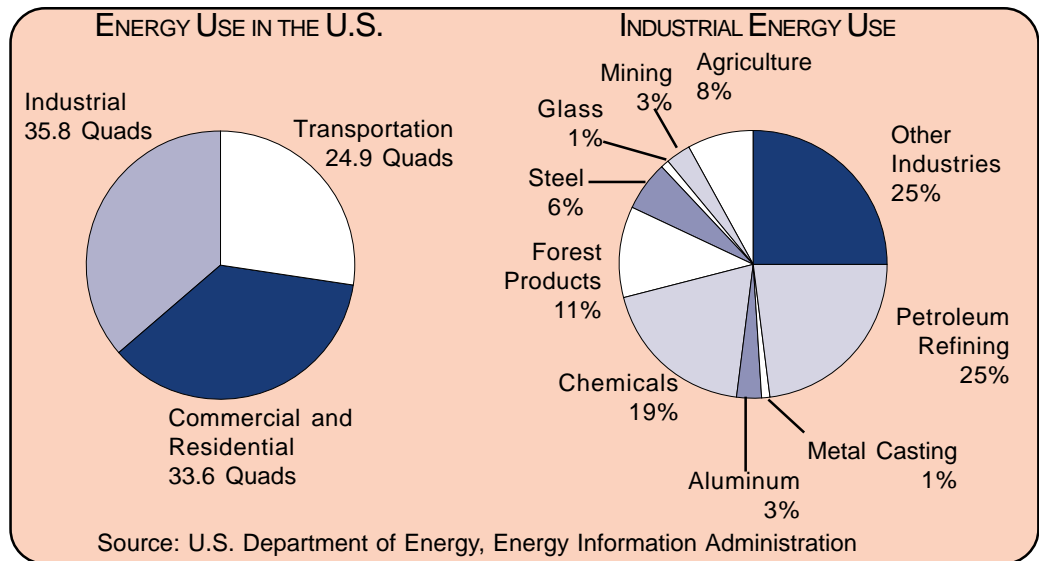
- A 25 percent improvement in energy efficiency and 30 percent reduction in emissions for the vision industries by 2010.
- A 35 percent improvement in energy efficiency and 50 percent reduction in emissions for the vision industries by 2020.

Situation Analysis

In 1997, U.S. industry spent over \$110 billion on purchased energy, consuming an estimated record 35 quads (quadrillion Btu's) — about 38 percent of all energy consumed in the United States. A small number of materials and process industries continue to account for over 75 percent of energy use and close to 90 percent of waste generation in industry. From 1990-1997 overall industrial energy use has increased 10 percent while real industrial output over the period 1990-1996 rose over 16 percent.

In 1997 natural gas and petroleum continued to be the primary industrial fuels, accounting for 31 and 28 percent respectively of industrial energy use. Electricity use has risen steadily over the past 45 years and now accounts for 10 percent of energy use; if conversion losses are included, electricity represents the largest energy use in industry at over 33 percent.

The role of energy in industry has changed over the past ten years and most companies in **energy intensive industries** have revamped their technology and business strategies to respond to changing market conditions. Several factors have prompted these changes and many are expected to continue to affect the rate of energy efficiency improvements in industry.



- **Real energy prices are historically low** and industrial energy intensity -- a measure of energy efficiency -- has been stagnant for the past 10 years. Because of its relative abundance and low price, energy has become a less important factor in business strategy, even in energy-intensive industries.
- **Environmental compliance requirements have placed additional resource demands on industry.** In 1994, business spent \$77 billion on pollution abatement and control. The additional cost and staff required for environmental compliance has diverted scarce investment capital away from technology investments and toward emissions control equipment. In some industries relatively low rates of return on capital have constrained the borrowing ability of companies. However, this need

to compete effectively and to reduce costs has also increased interest on the ability of new and improved energy-efficient technology to solve environmental problems.

- **New consumer and industrial products are becoming increasingly complex and technologically sophisticated.** This has placed new demands on materials to meet challenging performance criteria. High performance materials with complex designs will require new investments in research and development and often new technology strategies. Many firms find they no longer have all the scientific, technological, nor business resources to develop new processes or introduce new products on their own.

COMPETITIVE PRESSURES



- Many of the most energy intensive **industries are facing strong cost competition** from both foreign and domestic producers of alternative materials. Driven in part by shareholder expectations, many businesses are cutting all non-essential business expenditures including technology R&D — those unrelated to immediate production and sales — to improve near-term profitability.
- **Global climate change is emerging as a leading environmental issue** that has significant international and lifestyle implications. As the nation's largest energy-consuming sector, industry will be called upon to help reduce emissions of greenhouse gases. Progressive industries will embrace new technology approaches for reducing emissions and become models for other industries. This will likely increase interest in industrial energy efficiency as a way to reduce emissions without compromising performance or profitability.
- Electric utility and natural gas **industry restructuring is expected to lower energy prices for many industrial customers** and create additional energy options for manufacturers. Restructuring may have several effects including increased energy consumption, fuel shifts, more rapid turnover of energy-using equipment, and significantly reduced R&D investments by the utility industry.

Emphasis has increased within government to reduce overall spending and improve the efficiency of all public operations. Since 1987, real U.S. government R&D investment in applied energy technology R&D has decreased by about 15 percent while applied energy R&D by industry has been cut even more substantially. Two U.S. DOE studies suggest that industry has reduced its energy related technology development activities by as much as 50 percent since 1987 in the face of continuing relatively low energy prices.

In 1994, OIT reorganized its program to become more responsive to customer and national energy needs. OIT continues to seek new approaches to improve operational efficiency, increase customer satisfaction, and produce measurable benefits to the nation. Several factors will affect how OIT shapes its internal operational strategy:

- The ability to demonstrate **tangible benefits** resulting from the investment of public money will become increasingly important for government programs. The Government Performance and Results Act (GPRA) and the National Performance Review require Federal agencies to develop strategic plans, performance measures, annual performance plans, and performance reporting.
- OIT is addressing the concerns of Congress, the Administration, and the public to reduce overall Federal spending, **streamline and improve the productivity** of Federal activities, and trim discretionary budget items. Existing programs will require strong justification for continued Federal support and new budget growth.
- The Industries of the Future (IOF) strategy developed and promoted by OIT is recognized as an effective strategy for **industry-government collaboration**. Both Congress and the Administration have acknowledged the value of this approach and several industries have approached OIT to gain assistance in facilitating the process.

Core Values

The Office of Industrial Technologies adheres to a set of core values that underlies its operating philosophy and provides the foundation for its strategies. We continually strive to manifest our core values in our partnerships with our customers and in our daily contact with all stakeholders:

- OIT is a world-class leader in every aspect of our business, including development of our leadership skills.
- OIT continuously improves and grows, as an organization and as individuals, in all that we do.
- OIT delivers customer satisfaction as dependable and reliable partners.
- OIT fosters a workplace that creates spirit, energy, and respect as employees participate in reaching our mutual goals.
- OIT upholds its role as stewards of the public trust.

Key Operating Principles

The Office of Industrial Technologies passionately believes in its mission and our important contributions to the Nation. As individuals and team members:

- We enthusiastically communicate OIT's goals, activities, and achievements.
- We are guided by the IOF strategy as we deliver integrated products and services to our customers.
- We are dependable, accountable, and creative in following through on commitments.
- We provide a work environment with shared skills, honest communications, mutual trust, and respect.
- We recognize and celebrate our accomplishments.

Strategy

The strategy of the Office of Industrial Technologies is designed to effectively accomplish the OIT mission and goals and achieve the Office's long-term vision. It responds to the needs of markets, industry, and the nation, and is consistent with OIT's core values and operating principles.

Focus on energy and environmentally sensitive industries. A small number of materials and process industries account for the majority of energy use and waste production within the U.S. industrial sector. These industries, which transform raw materials into finished and semifinished products, provide the greatest opportunity for improving energy efficiency and environmental performance in industry. Nine energy-intensive industries are currently targeted as Industries of the Future (IOF) industries for energy savings and waste reduction: agriculture bio-based chemicals, chemicals, glass, forest products, steel, aluminum, metal casting, mining and petroleum. Together, these industries account for over 75 percent of energy use in the entire industrial sector. These industries are also responsible for about 90 percent of the estimated 12 billion tons of waste produced by industry each year.

Establish partnerships with industry. To successfully effect technology development and deployment in industry, OIT creates long-term partnerships with the energy- and waste-intensive industries. These partnerships require resource commitments by both OIT and industry, an understanding of each other's needs and expectations, and a trust that the partners will become advocates for the partnership. Because these partnerships are fundamental to OIT's overall strategy, OIT establishes a team to focus on each industry. Each team consists of individuals with diverse skills, abilities, and professional backgrounds to work with industry at all levels. They strive to create a working relationship based on mutual respect and trust that leads to a true partnership.

STRATEGIC ELEMENTS

Focus on energy and environmentally sensitive industries

Establish partnerships with industry

Facilitate the State IOF Process

Apply the IOF strategy to align industry and government resources

Support new IOF industries

Use integrated teams to accomplish program goals

Design flexible and responsive programs

Strengthen education and training of OIT staff

Monitor progress and performance

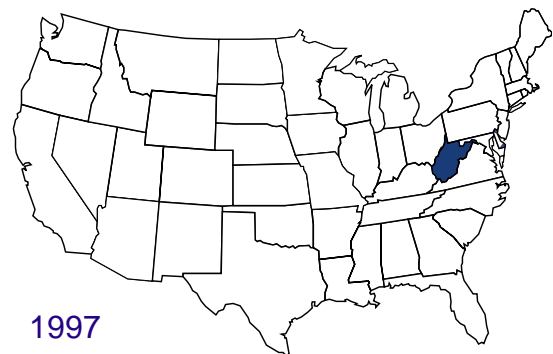
Conduct comprehensive planning to guide future program strategy

State Level IOF Activity

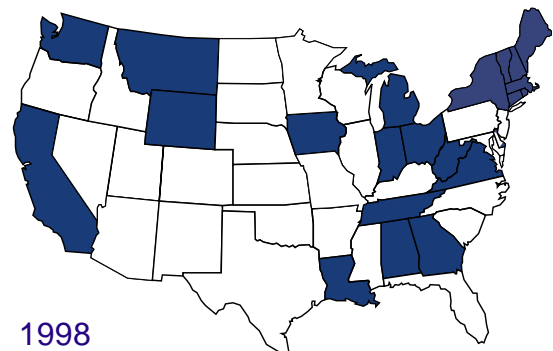
As a strong advocate for the IOF industries, OIT aggressively identifies opportunities for research partnerships with other programs within Energy Efficiency and Renewable Energy and other offices within DOE, other Federal agencies, states, and other industries. OIT influences these other organizations to align their research funds with the needs of the IOF industries thereby leveraging across broad funding areas. The partnership with OIT provides industry with access to current information on research that is being actively funded across the Federal Government. It also provides direct access to the Department of Energy national laboratory system through a single point of contact known as the Laboratory Coordinating Council. Other partners include industry trade associations, professional societies, academic institutions, and other non-government organizations.

Facilitate the States IOF Process. OIT, through Energy Efficiency and Renewable Energy's State Energy Program, partners with the states to mobilize their industries' involvement in state-level implementation of roadmaps and their influence on the National IOF process. Grants and OIT team support are provided to: (1) assist state level organizations and their local industries in education of the IOF strategy, (2) proposal development targeted at state and Federal funding opportunities, and (3) local industries in implementing new technologies in their plants.

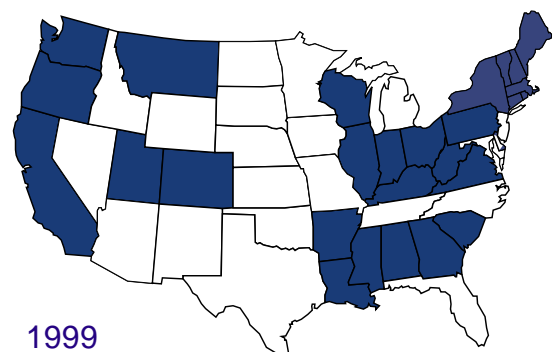
Apply the *Industries of the Future* strategy to align industry and government resources to areas of greatest need. Partnerships within industry and between industry and



1 State -- 1 Project



21 States -- 22 Projects



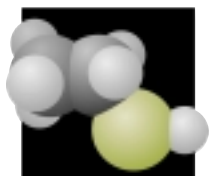
28 States -- 34 Projects



Agriculture



Aluminum



Chemicals



Forest Products



Glass



Metal Casting



Mining

government have proven to be the most effective approach for solving complex technological challenges that affect whole industries. The goal of the Industries of the Future strategy is to align the technological and financial resources of industry and government and apply them toward industry's top priorities. Industry must direct and own this strategy while government facilitates the process. The Office of Industrial Technologies facilitates the Industries of the Future strategy through critical functions:

- **Facilitate industry visions and roadmaps.** Industry leaders outline a future vision of their industry that is defined by explicit market, business, and technology goals. A roadmap is developed to articulate specific strategies and create a comprehensive research agenda. OIT assists industry by guiding them through the vision and roadmaps process and by acting as a neutral party that can bring together competitors, suppliers, customers, and other key stakeholders.
- **Cooperatively fund strategic projects.** Once industry has developed its roadmaps, OIT selectively cost-shares projects contained within the roadmaps that are consistent with the OIT mission and the government role. Research and development projects funded by OIT must demonstrate the potential to significantly improve energy efficiency and prevent pollution in raw material preparation and manufacturing processes in industry. Projects are typically funded when the risks and costs of conducting the R&D are so high or long term that it cannot attract sufficient private investment without government involvement. Cost-sharing with industry

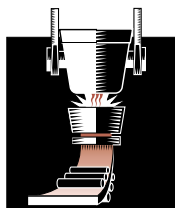
at an overall level of 50 percent which indicates a strong level of commitment from each partner and allows the maximum leveraging of Federal research funds is an important part of OIT's strategy.

As well as cost-shared research specific to each core IOF industry, OIT provides supporting programs which focus on enabling technologies, financial assistance, and systems design that represent the needs across multiple IOF industries. OIT pursues R&D in crosscutting technologies including cogeneration and advanced turbine systems, combustion, materials, and sensors and controls. OIT provides tools and services that provide immediate benefit by applying available state-of-the-art efficient technology. Companies can take advantage of energy and environmental audits of manufacturing facilities, industrial partnerships to increase the use of efficient electric motor and steam systems, cooperative grants with states and businesses to demonstrate and replicate clean and efficient technologies, and assistance to inventors to stimulate innovation and help commercialize ideas.

- **Leverage investment.** The resources and capabilities required to fully implement the research and technology strategies contained in the roadmaps are beyond the mission of the OIT program. Partnerships must be encouraged with other government agencies and industrial partners in order to tap into the technological and financial resources that correspond to the roadmaps. OIT has identified over 8,000 R&D projects in other Federal agencies that may contribute to the technology roadmaps of the IOF industries. OIT recognizes the importance of identifying and facilitating leveraging opportunities as a key component of the Industries of the Future strategy.



Petroleum Refining

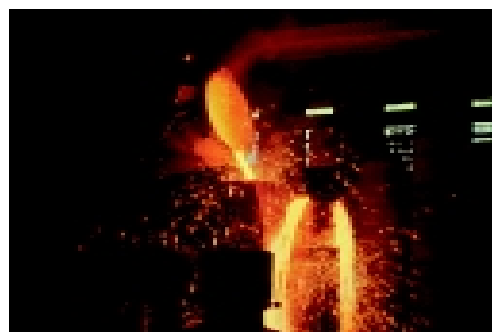


Steel

- **Communicate research results and partnership benefits.** The full benefit of OIT technologies and partnerships cannot be realized without an effective plan to communicate research results and publicize opportunities to benefit from efficient technologies and partnerships. A separate OIT communication strategy describes the overall approach and activities to accomplish this. Key communication objectives are to transfer results of R&D and commercialized technology, promote benefits of partnering and collaboration, publicize opportunities to participate in the OIT program, and integrate the Internet into OIT business and communications.



Support new IOF industries. OIT is committed to working with all industries that can benefit from advanced efficiency technology. However, budgetary constraints require that OIT provide various levels of partnerships that match the magnitude of potential energy and environmental benefits. OIT will carefully evaluate opportunities to support new IOF industries that would encompass full R&D partnerships. Working with interested industries and their appropriate technical organizations, OIT will assess opportunities in which an industry-government R&D partnership can generate substantial national and industry benefits. Where benefits are moderate or uncertain, OIT will help the industry to prepare a vision, technology roadmaps, and implementation plan, but may not participate in a full R&D partnership. Among the criteria that will be considered in determining OIT's level of support is the magnitude of energy use and waste production of the industry, the willingness of the whole industry to participate fully in the visioning and roadmapping process, whether the industry is distinctive compared to other IOF industries already participating in an OIT partnership, and the availability of Federal funds for the partnership.



The internal structure and organization of the OIT Program is designed to implement OIT's mission and goals in the most efficient effective manner. The following components of the OIT strategy describe how OIT performs its activities and implements its program:

Use integrated teams to accomplish program goals. The OIT Program is structured to serve the needs of its customers in the energy-intensive industries. OIT has formed industry teams that include staff drawn from each of its functional areas: process systems, crosscut technology, and technology access. These teams effectively integrate and align the capabilities and resources within OIT to best serve the needs of each industry. Each team draws upon its knowledge and skills to tailor OIT services and resources that match its industry's business and technology priorities. Through this approach, OIT builds a stronger understanding of the industry and its specific process needs.

Design flexible and responsive programs. OIT rejects the "one-size-fits-all" approach for industry partnerships. The industrial market structure, business practices, and technology resources of each industry require a tailored program design. Accordingly, OIT has developed new ways of working with industry partners and exploring innovative approaches to R&D management and procurement. For example, each industry has taken a somewhat different approach to developing its vision and technology roadmaps and OIT has facilitated these approaches as needed. The wide slate of programs and services offered by OIT ensures that businesses can participate and benefit in different ways. Some companies require assistance with electric motors, some require energy audits, some need guidance on visions and technology roadmaps, and some become partners in industry-wide technology R&D efforts. OIT meets customer needs by using its extensive organizational capabilities that include DOE's nationwide field management and national laboratory system.

Strengthen education and training of OIT staff. Continuous improvement in staff knowledge about the industries OIT serves, industrial technologies and processes, and innovative project management practices is vital for operating an effective national energy efficiency program. A variety of options is

available to OIT staff to expand their knowledge and skills. Staff are encouraged to attend workshops on the latest technologies and process issues, participate in plant tours, seek training in sound project management practices, and learn about opportunities for personnel exchange with industry.

Monitor progress and performance. The use of practical and relevant measures to evaluate improvements in industrial energy efficiency, environmental performance, and productivity is essential for an effective OIT program. OIT will improve the use of its "quality metrics" to measure future program benefits and provide a support source for R&D investment decisions. OIT will also improve its tracking of technology commercialization successes associated with the OIT Program to estimate actual benefits achieved in industry. OIT will monitor best practices in industry and government to ensure that the methods, tools, and techniques used to measure program performance are up-to-date and continuously improved. OIT will expand its efforts to solicit and measure customer satisfaction and respond to customer comments and recommendations.

Conduct comprehensive planning to guide future program strategy. OIT recognizes that pro-active program planning and evaluation are critical for a well-managed technology program. OIT-wide strategic planning will be complemented by an implementation plan. It is also important for OIT management to analyze, assess, and align the entire OIT portfolio to ensure the proper focus and balance of activities to meet its goals. From time to time, OIT will seek outside, independent reviews of its program to ensure its funded activities are consistent with its missions and goals, are aligned with the needs of industry, and are managed effectively. The 1997 - 1998 oversight review by the National Materials Advisory Board, National Research Council, is one example of how OIT ensures its programs are properly focused and managed.

Performance Measures

OIT carefully monitors its programs to ensure that its strategy is appropriate and its programs are being implemented effectively. Performance measures allow OIT to establish an operational benchmark and measure progress towards goals.

The effectiveness of OIT's overall strategy will ultimately be determined by the energy, environmental, and productivity gains that are achieved by industry as a result of OIT's involvement. However, many factors contribute to the commercial success of new technologies and OIT must judge its performance based on both the internal effectiveness of programs over which it has direct control, and the external outcomes and impacts that it can affect directly, or sometimes only indirectly.

To measure the **internal effectiveness** of program activities and management operations, the Office examines its effectiveness in the delivery of programs with its partners, the number of vision and technology roadmaps completed, the amount of leveraged funding, the satisfaction of its customers, and the variety and quality of program communications. Other important indicators are the average time to award new R&D contracts, and the time of invoicing of funds per project (un-costed balances).

The **external effectiveness** of OIT's programs is measured by its ability to affect and impact U.S. industry, the marketplace, and the Nation. The three main performance indicators are defined as:

- Increased commercialization of OIT-supported technologies, developed under the Industries of the Future roadmaps - - both in the number of new technologies recently commercialized, and the resulting energy savings from the technologies.
- Increased adoption of energy efficient best practices and technologies by OIT's Industries of the Future company partners within their manufacturing plants as influenced by OIT's programs.
- Increased participation in Industries of the Future activities at a variety of levels (R&D managers, plant operations/engineering staff, CEOs).

While industrial commercialization and application are largely dictated by market conditions, OIT substantiates its performance by measuring its impact on accelerating the adoption of advanced and commercially-available technology within thousands of manufacturing facilities. Metrics and performance measures will be tracked for the number of new commercialized technologies and other technical successes, the level of improvement in industrial energy efficiency and productivity, and the reduction of the industrial waste stream. Improvements in energy efficiency and pollution prevention also have a significant effect on the marketplace and on socioeconomic issues such as carbon reductions, reduced global warming, and cost savings for businesses and consumers.

Implementation

The *OIT Strategic Plan* establishes the framework for OIT programs. By identifying its vision, mission, and goals, the *Plan* sets the course for the Program and its activities. It also concisely describes the key elements of its strategy, the factors that drive them, and indicators of performance. To ensure success, OIT must implement its programs effectively, employing sound Federal research management strategies. OIT has developed an *Implementation Plan* that provides specific guidance for implementing key elements of the strategy. Four essential areas for which OIT provides guidance include research cost-sharing, technology portfolio management, criteria for supporting new IOF industries, and performance measures.

Industrial cost-sharing of research is the most effective means for ensuring eventual commercial success of any developed technologies and for leveraging public monies. It is a requirement of all OIT-sponsored R&D. Public investment in research and development implies that a clear and substantial national benefit be derived from the investment of public funds.

Responsible **portfolio management of research projects** that reflects a responsive and balanced program is essential for meeting program goals. OIT requires its industry teams to make responsible funding decisions which build and maintain a balanced portfolio of projects that together will effectively fulfill DOE's goals in energy efficiency and environmental benefits. Open and competitive processes are used to ensure fairness in the selection of projects for funding. These competitive solicitations will be performed in close collaboration with industry to ensure they maximize meeting the industry roadmaps priorities.

OIT will consider partnership **support for new IOF industries** based on specified criteria. This criteria will focus on the potential for the partnership to help the industry make significant improvements in its energy efficiency and environmental programs.

Performance measures have been developed for evaluating the progress of the OIT program. The definition of these measures and the metrics that will be used will continue to be refined. The Implementation Plan provides additional guidance on performance metrics and their application.

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